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Facsimile Information Sheet

DATE: August 16, 2010

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TO:

RECIPIENT	*COMPANY*	*FAX NUMBER*
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OUR REF NO: DRJ 04524 PTUS

RE: Application No. 09/829,084
Titled: Method and Apparatus for Automatic Control of Cage Size in an Extruded Film Production Line

TOTAL NUMBER OF PAGES (including this sheet): 11

MESSAGE:

Please see attached draft Claims and Remarks for discussion in an interview tomorrow.

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Draft Claims and Remarks for Interview

CLAIMS

1. (Currently Amended) An apparatus for positioning an adjustable sizing cage [[I]]in a blown film extrusion apparatus in which film is extruded as a tube from an annular die and then pulled along a predetermined path and located within [[an]] the adjustable sizing cage, ~~an~~ the apparatus ~~for positioning said adjustable sizing cage,~~ comprising:

~~(a) means for varying a quantity of air within said extruded film tube, including:~~

~~(1)~~ a supply blower which supplies air to said extruded film tube in an amount corresponding to a supply control signal[[, and]];

~~(2)~~ an exhaust blower which exhausts air from said extruded film tube in an amount corresponding to an exhaust control signal;

~~(b)~~ a controller member including executable program instructions which define at least one control routine for automatic and coordinated control of said ~~means for varying~~ at least one of the exhaust or supply blowers during ~~operation of~~ extrusion of said extruded film tube by directing a series of supply control signals to said supply blower and/or exhaust control signals to said exhaust blower;

~~(c)~~ a sizing cage subsystem surrounding said extruded film tube and including an electrically[[-]] actuable and controllable actuator configured for moving said sizing cage inward and outward relative to said extruded film tube;

~~(d)~~ at least one first non-contact sensor for measuring a distance between said cage subsystem and said extruded tube;

~~(e)~~ at least one additional non-contact sensor[[s]] for measuring a diameter of said extruded tube; and

~~(f)~~ wherein said executable program instructions include a cage position control routine which is capable of utilizing said sizing cage subsystem-to-tube distance to control a location of said sizing cage subsystem when moving said sizing cage subsystem from a first position to a second position during startup and resizing of said extruded film tube.

2. (Currently Amended) An apparatus for positioning an adjustable sizing cage according to Claim 1, ~~further comprising:~~

~~(g)~~ wherein said at least one additional sensor includes at least second and third noncontact sensors that are located in fixed positions equally spaced around said sizing cage subsystem.

3. (Currently Amended) An apparatus for positioning an adjustable sizing cage according to Claim 1, ~~further comprising:~~

~~(g)~~ wherein said at least one first non-contact sensor is mounted to a moving arm of said sizing cage subsystem, wherein movement of said sizing cage subsystem results in a corresponding movement of said first non-contact sensor.

4. (Cancelled)

5. (Cancelled)

6. (Currently Amended) An apparatus for positioning an adjustable sizing cage according to Claim 1, ~~further comprising:~~

~~(g)~~ wherein said cage position control routine further includes a cage positioning routine which is capable of utilizing said electrically-actuable and controllable actuator to reposition said sizing cage subsystem relative to a predetermined set point defining a finished product diameter.

7. (Currently Amended) An apparatus for positioning an adjustable sizing cage according to Claim 6, ~~further comprising:~~

~~(h)~~ wherein said cage position control routine operates non-simultaneously in at least the following two modes of operation:

~~(1)~~ a forecast mode of operation when said sizing cage subsystem is located more than a first distance from said predetermined set point, wherein during operation in said forecast mode said sizing cage subsystem-to-tube distance is allowed to vary beyond a second distance; and

~~(2)~~ a ~~contact~~ mode of operation when said sizing cage subsystem is located less than the first distance from said predetermined set point, wherein during operation in said contact mode said sizing cage subsystem-to-tube distance is maintained less than the second distance.

8. (Currently Amended) An apparatus for positioning an adjustable sizing cage according to Claim 7, ~~further comprising:~~

~~(i)~~ wherein, when said cage position control routine operates in said forecast mode of operation, control signals are supplied to said controller by said cage position control routine which cause a movement of said sizing cage subsystem through a series of steps.

9. (Currently Amended) An apparatus for positioning an adjustable sizing cage according to Claim 7, ~~further comprising:~~

~~(i)~~ wherein during said contact mode of operation, said cage position control routine allows a user to introduce slight overage or underage values to said extruded film tube in order to slightly move said sizing cage subsystem inward or outward to over-squeeze or under-squeeze said extruded film tube.

10. (Currently Amended) An apparatus for positioning an adjustable sizing cage according to Claim 8, ~~further comprising:~~

~~(j)~~ wherein said blown film extrusion apparatus includes an additional control system for monitoring and adjusting a finished product diameter for said extruded film tube; and

~~(k)~~ wherein during said forecast mode of operation, control signals are supplied, by said cage position control routine to said additional control system, which misrepresent actual measurements of said finished product diameter for said extruded film tube, wherein said additional control system operates to change the size of said extruded film tube.

11. (Previously Amended) An apparatus for positioning an adjustable sizing cage according to Claim 8, wherein, during said forecast mode of operation, said cage position control routine operates so that said control signals are supplied to move said sizing cage subsystem, through said series of steps, to the second position for said extruded film tube.

12. (Withdrawn) A method of operating a blown film extrusion apparatus, in which film is extruded as a tube from an annular die and then pulled along a predetermined path and located within an adjustable sizing cage, comprising the steps of:

varying a quantity of air within the extruded film tube to cause the extruded film tube to maintain a desired diameter;

measuring a diameter of the extruded film using at least second and third non-contact sensors;

measuring a distance between the adjustable sizing cage and the extruded film using a first non-contact sensor, and generating a control signal proportional thereto;

within an automatic controller, utilizing the control signal to calculate a desired sizing cage position; and

driving an electrically driven actuator to position the sizing cage at the desired sizing cage position.

13. (Withdrawn) The method of Claim 12, wherein the automatic controller operates in at least the following two modes of operation:

(1) a forecast mode of operation wherein the adjustable sizing cage is located a relatively large distance from a predetermined set point; and

(2) a contact mode of operation wherein the adjustable sizing cage is located a relatively small distance from the predetermined set point;

wherein during the forecast mode of operation, the automatic controller provides control signals to drive the electrically driven actuator to position the sizing cage, through a series of steps, to the predetermined set point.

14. (Withdrawn) The method of Claim 13, wherein during the contact mode of operation, the automatic controller provides control signals to drive the electrically driven actuator to position the sizing cage a selected distance from the extruded film tube.

15. (Withdrawn) The method of Claim 13, wherein an operator is permitted to introduce slight overage or underage values to the controller, wherein the controller drives the actuator to slightly move the sizing cage inward or outward to over-squeeze or under-squeeze the extruded film tube.

16. (Currently Amended) An apparatus for positioning an adjustable sizing cage according to Claim 6, ~~further comprising:~~

~~(b)~~ wherein said cage position control routine is capable of operating non-simultaneously in at least the following two modes of operation:

~~(1)~~ a forecast mode of operation when said sizing cage subsystem is located more than a first distance from said predetermined set point, wherein during operation in said forecast mode said sizing cage subsystem-to-tube distance is allowed to vary beyond a second distance; [[and]]

~~(2)~~ a contact mode of operation when said sizing cage subsystem is located less than a third distance, which is less than the first distance, from said predetermined set point, wherein during operation in said contact mode said sizing cage subsystem-to-tube distance is maintained less than the second distance; and

~~(3)~~ further wherein, when, while operating in either said forecast mode or said contact mode, said sizing cage subsystem becomes located a distance from said predetermined set point which is less than said first distance and greater than said third distance; said cage position control routine remains operating in whichever of said modes it is currently in.

17. (Previously Presented) An apparatus for positioning an adjustable sizing cage according to Claim 16, ~~further comprising:~~

~~(i)~~ wherein, when said cage position control routine operates in said forecast mode of operation, control signals are supplied to said controller by said cage position control routine which cause a movement of said sizing cage subsystem through a series of steps.

18. (Previously Presented) An apparatus for positioning an adjustable sizing cage according to Claim 17, wherein said steps have a length approximately equal to one-half of said first distance.

19. (Previously Presented) An apparatus for positioning an adjustable sizing cage according to Claim 8, wherein said steps have a length approximately equal to one-half of said first distance.

20. (Previously Presented) An apparatus for positioning an adjustable sizing cage according to Claim 1, wherein said at least one first and said at least one additional sensors are mounted a fixed vertical distance apart.

21. (Previously Presented) An apparatus for positioning an adjustable sizing cage according to Claim 20, wherein said at least one first sensor is mounted below said at least one additional sensor.

22. (Previously Presented) An apparatus for positioning an adjustable sizing cage according to Claim 7, wherein, if the distance between said sizing cage subsystem and said extruded film becomes less than a predefined distance, said cage position control routine is capable of pausing movement of said sizing cage subsystem.

23. (New) An apparatus for positioning an adjustable sizing cage in a blown film extrusion apparatus in which film is extruded as a tube from an annular die and then pulled along a predetermined path and located within the adjustable sizing cage, the apparatus comprising:

an airflow control system for controlling the quantity of air in the tube, the system including:

a supply blower which supplies air to the extruded film tube in an amount corresponding to a supply control signal,

an exhaust blower which exhausts air from the extruded film tube in an amount corresponding to an exhaust control signal;

a sizing cage subsystem surrounding the extruded film tube and including an actuator configured for moving the sizing cage inward and outward relative to the extruded film tube;

a plurality of sensors configured and arranged to measure a distance between the cage subsystem and the extruded tube and configured to measure a diameter of the extruded tube; and

a cage position controller configured to move the sizing cage inward or outward relative to the extruded film tube during extrusion of the tube, responsive to the measurements made by the sensors.

24. (New) An apparatus for positioning an adjustable sizing cage according to Claim 23, wherein said at least one first non-contact sensor is mounted to a moving arm of the sizing cage subsystem, wherein movement of said sizing cage subsystem results in a corresponding movement of said first non-contact sensor.

25. (New) An apparatus for positioning an adjustable sizing cage according to Claim 23, wherein the cage position controller further includes a cage positioning routine which is capable of utilizing the actuator to reposition the sizing cage subsystem relative to a predetermined set point defining a finished product diameter.

26. (New) An apparatus for positioning an adjustable sizing cage according to Claim 25, wherein said cage position control routine operates non-simultaneously in at least the following two modes of operation:

a forecast mode of operation when the sizing cage subsystem is located more than a first distance from the predetermined set point, wherein during operation in the forecast mode said sizing cage subsystem-to-tube distance is allowed to vary beyond a second distance; and

a contact mode of operation when the sizing cage subsystem is located less than the first distance from the predetermined set point, wherein during operation in the contact mode the sizing cage subsystem-to-tube distance is maintained less than the second distance.

26. (New) An apparatus for positioning an adjustable sizing cage according to Claim 25, wherein, when the cage position control routine operates in said forecast mode of operation,

control signals are supplied to cage position controller that cause a movement of said sizing cage subsystem through a series of steps.

27. (New) An apparatus for positioning an adjustable sizing cage according to Claim 25, wherein during the contact mode of operation, the cage position control routine allows a user to introduce slight overage or underage values to the extruded film tube in order to slightly move the sizing cage subsystem inward or outward to over-squeeze or under-squeeze said extruded film tube.

28. (New) An apparatus for positioning an adjustable sizing cage according to Claim 26:

wherein the blown film extrusion apparatus includes an additional control system for monitoring and adjusting a finished product diameter for the extruded film tube; and

wherein during the forecast mode of operation, control signals are supplied, by the cage position control routine to said additional control system, which misrepresent actual measurements of said finished product diameter for the extruded film tube, wherein the additional control system operates to change the size of said extruded film tube.

REMARKS

Claims 1-11 and 23-28 are pending in the application. Claims 1-11 are hereby amended to eliminate means-plus-function treatment and to correct various minor errors. Claims 23-28 are new but are of generally the same scope as Claims 1-11.

The claims stand rejected under 35 U.S.C. § 103 over Joseph in view of Schott. Neither Joseph nor Schott disclose the ability to change the size of the sizing cage during extruding operation. Both references do disclose sensors on the sizing cage, but these only regulate airflow in the tube.

As recited in Claims 1 and 23, the cage sizing subsystem uses sensors and then alters the cage size during extruding operation, which neither Joseph nor Schott are capable of doing.